INCORPORATING ALTERNATIVES TO PVC IN BUILDINGS

FREQUENTLY ASKED QUESTIONS

1. What is PVC?

PVC stands for polyvinyl chloride and is also known as "vinyl". It is a synthetic polymer material (or resin), formed by combining ethylene (derived from petroleum, natural gas, or coal) and chlorine. The resulting compound, ethylene dichloride (EDC) is catalyzed to form a gas called vinyl chloride monomer (VCM). Polymerization of the VCM results in the white powder or resin known as PVC or vinyl. Chemical additives are mixed with the PVC to give it different characteristics such as flexibility, resilience, or fire resistance. (HDR, not dated). The chlorine in PVC represents 57% of the weight of the pure polymer resin (Commission of the European Communities, 2000).

2. What are the uses of PVC?

PVC is commonly used in building construction, interior furnishings, packaging, office supplies, electronics and appliances, medical equipment, and vehicle parts. This fact sheet focuses on the use of PVC in building construction.

3. Why is PVC a problem?

The manufacture, use, and disposal of PVC poses substantial and unique environmental and human health hazards due to the formation and release of hazardous organochlorine by-products (Thornton, 2002). During the manufacture of PVC, dioxin and other persistent pollutants are created as by-products. During use, PVC products can leach potentially harmful additives like phthalate plasticizers and lead or other heavy metal stabilizers. Dioxins and other by-products are emitted when PVC is burned during incineration or in accidental fires in buildings, warehouses, or landfills. Because no significant markets exist for the recycling of PVC, the material will typically be landfilled, where additives can leach out. (Commission of the European Communities, 2000; Healthy Building Network, 2002) More information regarding the hazards of dioxins can be found in the *Screening Evaluation of Dioxins Pollution Prevention Options*, a report commissioned by the Association of Bay Area Governments Dioxins Task Force (TDC Environmental, 2001).

4. How is PVC used in buildings?

Approximately 75% of all PVC produced is for building products (Healthy Building Network, 2002). Piping, vinyl siding, and vinyl flooring are the largest and most familiar uses of PVC. Roof membranes are another growing area. PVC is also used in electrical wire, conduit, carpet backing, windows, door frames, wall coverings, siding, furniture, shutters and blinds, gutters, downspouts, waterstops, flashing, moldings, and elsewhere.

(Healthy Building Network website). The overriding reason for this popularity is PVC's low manufacturing cost and adaptability to diverse applications. It is also mechanically tough, fairly weather resistant, water and chemicals resistant, and electrically insulating.

Vinyl is the largest, and fastest growing, use of chlorine in the world, accounting for more than 40% of all chlorine use in the United States. In fact, it is the only major chlorine application still increasing in the world's wealthy nations, and it is growing particularly rapidly in developing countries. (Thornton, 2002).

5. What are the alternatives to PVC in building materials?

PVC has replaced many "traditional" building materials such as wood, concrete and clay in many areas. For almost all PVC applications, more environmentally friendly alternatives exist that use more sustainable, traditional, local materials. PVC can also be replaced by a variety of other, less environmentally damaging plastics, such as polyurethane, polystyrene, polyethylene, polypropylene, and bio-based plastics.

Bio-based plastics can be made out of products obtained from natural living raw materials such as starch, cellulose (from wood or cotton), horn (hardened protein) and raw rubber. The advantage of bio-polymers is that they readily degrade and can be composted. Converted natural polymers include vulcanized rubber, vulcanized fiber, celluloid and casein protein.

Below is a table containing many common uses of PVC in buildings and corresponding alternative materials. The table is not comprehensive, but gives a good overview of alternatives (Healthy Building Network, 2002; TDC Environmental, 2001).

Examples of PVC Products in Buildings and Alternatives

Common PVC Use	Alternative Material
Piping	Cast iron, steel, vitrified clay, concrete, copper, and plastics such as HDPE (High Density Polyethylene)
Siding	Fiber-cement board, certified sustainable wood, polypropylene, acrylic, stucco, brick. aluminum
Roofing Membranes	Thermoplastic polyolefins (TPOs) and EPDM (ethylene propylene diene monomer) membranes, low slope metal roofing
Flooring and Carpet	Natural linoleum, bamboo, ceramic tile, carpeting with natural fiber backing, reclaimed or sustainable wood, cork, recycled rubber, concrete, Stratica and other nonchlorinated plastics.
Wall Coverings	Natural fibers (wood, wool, etc.), polyethylene, polyester, paint, tiles.
Electrical Insulation and Sheathing	Halogen free, linear low-density polyethylene (LLDPE), thermoset crosslinked polyethylene (XLPE)
Windows and Doors	Recycled, reclaimed or certified sustainable wood,

	fiberglass, and aluminum.
Furniture	Wood, metal, textiles, leather, and chlorine-free plastics such as butadiene-polyamide copolymer

6. Are there any examples of efforts to reduce or eliminate PVC usage in buildings?

Yes. The use of PVC in major projects such as the United Kingdom-French Chunnel, the US EPA headquarters in Washington DC, and the 2000 Olympic Village in Sydney, Australia has been significantly reduced or completely eliminated. The US Navy, NASA, and the New York Subway are currently working on reduction of PVC in their projects. (Healthy Building Network, 2002.)

7. What is the ABAG Dioxins Task Force doing in relation to this issue?

The Association of Bay Area Governments (ABAG) Dioxins Task Force is following a hospital reconstruction project in San Francisco (Laguna Honda). The Healthy Building Network is assisting San Francisco with this effort. A written case study will be produced which describes the project and the effort to reduce PVC in the building materials. Information related to the development of specification language as well as contractor and vendor response to the efforts to replace PVC will be discussed. The ABAG Task Force's consultant will also contribute to Healthy Building Network's efforts to put together a comprehensive matrix related to PVC Free Building Materials.

8. Where can I find more information?

A compilation of more detailed information related to specific product alternatives accompanies this FAQ sheet.

Additionally, a number of on-line resource guides exist regarding green construction materials. Be careful, however, as some construction materials labeled "green" actually contain recycled PVC. The Healthy Building Network's database specifically screens for PVC. Subscribing to the Environmental Building News provides access to an online green building materials database, which includes a section for alternatives to PVC.

- Architectural Record Green Database
  www.archrecord.com/green/green.asp
- Environmental Building News
  www.buildinggreen.com
- Environmental Design+Construction Magazine
  www.edcmag.com/
- HDR Architecture
  www.hdrinc.com/sustainable/
- Healthy Building Network PVC Alternatives Database
  www.healthybuilding.net/

Directories you can order:

- NorCal ADPSR *Architectural Resource Guide* www.adpsr-norcal.org
- Environmental Building News *GreenSpec* www.buildinggreen.com

References:

Commission of the European Communities. 2000. *Green Paper: Environmental Issues of PVC*, July 26, 2000.

HDR Architecture. Not dated. *White Paper – PVC*. Website: www.hdrinc.com/Architecture/images/PVCWhitePaper.pdf

Healthy Building Network. 2002. *PVC in Buildings: Hazards and Alternatives*, May 7, 2002. From website: www.healthybuilding.net

TDC Environmental. 2001. *Screening Evaluation of Dioxins Pollution Prevention Options*. Prepared for the San Francisco Bay Area Dioxins Project. September 5, 2001.

Thornton, Joe. 2002. *Environmental Impacts of Polyvinyl Chlorine (PVC) Building Materials*. A briefing paper for the Healthy Building Network. (Accessed 4/2/02 at www.healthybuilding.net)